CLAIMS

What is claimed is:

1. An apparatus comprising:

a detector detecting disconnection in an optical transmission line in accordance with Brillouin scattering occurring in the transmission line.

2. An apparatus as in claim 1, wherein, prior to the detection of a disconnection by the detector, signal light is transmitted through the transmission line at a power level above a predetermined level, the apparatus further comprising:

a controller reducing the power level of the signal light to be at or below the predetermined level when the detector detects disconnection.

3. An apparatus as in claim 2, further comprising:

an optical amplifier amplifying the signal light, wherein the controller controls gain of the optical amplifier to thereby control the power level of the signal light.

4. An apparatus as in claim 2, further comprising:

a variable optical attenuator optically attenuating the signal light, wherein the controller controls attenuation of the variable optical attenuator to thereby control the power level of the signal light.

5. An apparatus as in claim 1, further comprising:

an optical transmitter transmitting a light which alternately exhibits a spectrum line width wider than a Brillouin bandwidth and a spectrum line width narrower than the Brillouin bandwidth, the transmitted light provided to the transmission line so that the transmitted light travels in the transmission line and thereby causes returning light to be generated in the transmission line in a reverse direction to the transmitted light in accordance with Brillouin scattering occurring in the transmission line, wherein the detector detects the returning light and detects disconnection from the detected returning light.

6. An apparatus as in claim 5, wherein the detector detects disconnection in accordance with a Stokes component in the detected returning light.

7. An apparatus as in claim 2, further comprising:

an optical transmitter transmitting a light which alternately exhibits a spectrum line width wider than a Brillouin bandwidth and a spectrum line width narrower than the Brillouin bandwidth, the transmitted light provided to the transmission line so that the transmitted light travels in the transmission line and thereby causes returning light to be generated in the transmission line in a reverse direction to the transmitted light in accordance with Brillouin scattering occurring in the transmission line, wherein the detector detects the returning light and detects disconnection from the detected returning light.

8. An apparatus as in claim 3, further comprising:

an optical transmitter transmitting a light which alternately exhibits a spectrum line width wider than a Brillouin bandwidth and a spectrum line width narrower than the Brillouin bandwidth, the transmitted light provided to the transmission line so that the transmitted light travels in the transmission line and thereby causes returning light to be generated in the transmission line in a reverse direction to the transmitted light in accordance with Brillouin scattering occurring in the transmission line, wherein the detector detects the returning light and detects disconnection from the detected returning light.

9. An apparatus as in claim 4, further comprising:

an optical transmitter transmitting a light which alternately exhibits a spectrum line width wider than a Brillouin bandwidth and a spectrum line width narrower than the Brillouin bandwidth, the transmitted light provided to the transmission line so that the transmitted light travels in the transmission line and thereby causes returning light to be generated in the transmission line in a reverse direction to the transmitted light in accordance with Brillouin scattering occurring in the transmission line, wherein the detector detects the returning light and detects disconnection from the detected returning light.

10. A method comprising:

detecting disconnection in an optical transmission line in accordance with Brillouin scattering occurring in the transmission line.

11. A method as in claim 10, wherein, prior to the detection of a disconnection, signal light is transmitted through the transmission line at a power level above a predetermined level, the method further comprising:

reducing the power level of the signal light to be at or below the predetermined level when the detector detects disconnection.

12. A method as in claim 11, further comprising:

amplifying the signal light with an optical amplifier, wherein said reducing controls gain of said amplifying to thereby control the power level of the signal light.

13. A method as in claim 11, further comprising:

optically attenuating the signal light, wherein said reducing controls attenuation of said optical attenuating to thereby control the power level of the signal light.

14. A method as in claim 10, further comprising:

transmitting a light which alternately exhibits a spectrum line width wider than a Brillouin bandwidth and a spectrum line width narrower than the Brillouin bandwidth, the transmitted light provided to the transmission line so that the transmitted light travels in the transmission line and thereby causes returning light to be generated in the transmission line in a reverse direction to the transmitted light in accordance with Brillouin scattering occurring in the transmission line, wherein said detecting detects the returning light and detects disconnection from the detected returning light.

15. A method as in claim 14, wherein said detecting detects disconnection in accordance with a Stokes component in the detected returning light.

16. A method as in claim 11, further comprising:

transmitting a light which alternately exhibits a spectrum line width wider than a Brillouin bandwidth and a spectrum line width narrower than the Brillouin bandwidth, the transmitted light provided to the transmission line so that the transmitted light travels in the transmission line and thereby causes returning light to be generated in the transmission line in a reverse direction to the transmitted light in accordance with Brillouin scattering occurring in the transmission line, wherein said detecting detects the returning light and detects disconnection from the detected returning light.

17. A method as in claim 12, further comprising:

transmitting a light which alternately exhibits a spectrum line width wider than a Brillouin bandwidth and a spectrum line width narrower than the Brillouin bandwidth, the transmitted light provided to the transmission line so that the transmitted light travels in the transmission line and thereby causes returning light to be generated in the transmission line in a reverse direction to the transmitted light in accordance with Brillouin scattering occurring in the transmission line, wherein said detecting detects the returning light and detects disconnection from the detected returning light.

18. A method as in claim 13, further comprising:

transmitting a light which alternately exhibits a spectrum line width wider than a Brillouin bandwidth and a spectrum line width narrower than the Brillouin bandwidth, the transmitted light provided to the transmission line so that the transmitted light travels in the transmission line and thereby causes returning light to be generated in the transmission line in a reverse direction to the transmitted light in accordance with Brillouin scattering occurring in the transmission line, wherein said detecting detects the returning light and detects disconnection from the detected returning light.

19. An apparatus comprising:

means for causing Brillouin scattering to occur in an optical transmission line; and

means for detecting disconnection in the transmission line in accordance with the caused Brillouin scattering.

20. An apparatus comprising:

a transmitter transmitting light which is provided to, and travels in, an optical transmission line, the transmitted light causing Brillouin scattering to occur in the transmission line, the Brillouin scattering thereby causing returning light to travel in the transmission line in a reverse direction than the light transmitted by the transmitter; and

a detector detecting the returning light, and detecting disconnection in the transmission line in accordance with the detected returning light.

21. An apparatus as in claim 20, wherein, prior to the detection of the disconnection by the detector, signal light travels through the transmission line at a power level above a predetermined level and in the same direction as the light transmitted by the transmitter, the apparatus further comprising:

a controller reducing the power level of the signal light to be at or below the predetermined level when the detector detects disconnection.

22. An apparatus as in claim 21, further comprising:

an optical amplifier amplifying the signal light, wherein the controller controls gain of the optical amplifier to thereby control the power level of the signal light.

23. An apparatus as in claim 21, further comprising:

a variable optical attenuator optically attenuating the signal light, wherein the controller controls attenuation of the variable optical attenuator to thereby control the power level of the signal light.

24. An apparatus as in claim 21, wherein the light transmitted by the transmitter alternately exhibits a spectrum line width wider than a Brillouin bandwidth and a spectrum line width narrower than the Brillouin bandwidth, to thereby cause the Brillouin scattering to occur.

25. An apparatus comprising:

an optical transmitter transmitting a light which alternately exhibits a spectrum line width wider than a Brillouin bandwidth and a spectrum line width narrower than the Brillouin bandwidth, the transmitted light provided to an optical transmission line so that the transmitted light travels in the transmission line and thereby causes returning light to be generated in the transmission line; and

an optical detecting section detecting the returning light, wherein disconnection of the transmission line is detected from the detected returning light.

26. A method comprising:

transmitting a light in an optical transmission line, the transmitted light causing Brillouin scattering to occur in the transmission line which thereby causes a returning light to travel in the transmission line in an opposite direction than the transmitted light;

detecting the returning light; and

detecting disconnection of the transmission line in accordance with the detected returning light.

27. A method as in claim 26, wherein a signal light travels through the transmission line in the same direction as, and concurrently with, the transmitted light.

28. A method as in claim 27, wherein the signal light and the transmitted light are at different wavelengths.

29. A method as in claim 28, further comprising:

controlling a power level of the signal light in accordance with said detecting disconnection.

30. An apparatus comprising:

means for transmitting a light in an optical transmission line, the transmitted light causing Brillouin scattering to occur in the transmission line which thereby causes a returning light to travel in the transmission line in an opposite direction than the transmitted light;

means for detecting the returning light; and

means for detecting disconnection of the transmission line in accordance with the detected returning light.

31. An apparatus as in claim 30, wherein a signal light travels through the transmission line in the same direction as, and concurrently with, the transmitted light.

32. An apparatus as in claim 31, wherein the signal light and the transmitted light are at different wavelengths.

33. An apparatus as in claim 31, further comprising:

means for controlling a power level of the signal light in accordance with said means for detecting disconnection.

34. A method comprising:

transmitting a light in an optical transmission line, the transmitted light causing a returning light having a Stokes component to travel in the transmission line in an opposite direction than the transmitted light;

detecting the returning light; and

detecting disconnection of the transmission line in accordance with the Stokes component of the detected returning light.

35. A method as in claim 34, wherein a signal light travels through the transmission line in the same direction as, and concurrently with, the transmitted light.

36. A method as in claim 35, wherein the signal light and the transmitted light are at different wavelengths.

37. A method as in claim 35, further comprising:

controlling a power level of the signal light in accordance with said detecting disconnection.

38. An apparatus comprising:

means for transmitting a light in an optical transmission line, the transmitted light causing a returning light having a Stokes component to travel in the transmission line in an opposite direction than the transmitted light;

means for detecting the returning light; and

means for detecting disconnection of the transmission line in accordance with the Stokes component of the detected returning light.

39. An apparatus as in claim 38, wherein a signal light travels through the transmission line in the same direction as, and concurrently with, the transmitted light.

40. An apparatus as in claim 39, wherein the signal light and the transmitted light are at different wavelengths.

41. An apparatus as in claim 39, further comprising:

means for controlling a power level of the signal light in accordance with said means for detecting disconnection.

42. A method comprising:

transmitting a light in an optical transmission line, the transmitted light causing Brillouin scattering to occur in the transmission line which thereby causes a returning light having a low frequency component to occur in the transmission line and to travel in the transmission line in an opposite direction than the transmitted light;

detecting the returning light; and

detecting disconnection of the transmission line in accordance with the low frequency component of the detected returning light.

43. A method as in claim 42, wherein a signal light travels through the transmission line in the same direction as, and concurrently with, the transmitted light.

44. A method as in claim 43, wherein the signal light and the transmitted light are at different wavelengths.

45. A method as in claim 43, further comprising:

controlling a power level of the signal light in accordance with said detecting disconnection.

46. An apparatus comprising:

means for transmitting a light in an optical transmission line, the transmitted light causing Brillouin scattering to occur in the transmission line which thereby causes a returning light having a low frequency component to occur in the transmission line and to travel in the transmission line in an opposite direction than the transmitted light;

means for detecting the returning light; and

means for detecting disconnection of the transmission line in accordance with the low frequency component in the detected returning light.

47. An apparatus as in claim 46, wherein a signal light travels through the transmission line in the same direction as, and concurrently with, the transmitted light.

48. An apparatus as in claim 47, wherein the signal light and the transmitted light are at different wavelengths.

49. An apparatus as in claim 46, further comprising:

means for controlling a power level of the signal light in accordance with said means for detecting disconnection.